BACTERIAL SPOT OF CUCUMBERS

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WHAT IS BACTERIAL SPOT OF CUCUMBERS?

Bacterial spot of cucumber fruits, as the name suggests, is a disease caused by bacteria.[1] They also attack the foliage of growing cucumber plants, causing the disease known as angular leaf-spot. None of the horticultural varieties of cucumbers now grown are known to be resistant to the disease. The watermelon, muskmelon, and squash are not known to be affected by this trouble.

WHAT IS THE EFFECT OF BACTERIAL SPOT ON THE FRUIT?

Bacterial spot lowers the price of affected fruit and often renders it unsalable because it opens the way for fungi which cause soft-rot. The fruit spots, which are at first evident as minute circular water-soaked areas, later become conspicuous, owing to the fact that the centers take on a chalky white color brought about by a drying and cracking of the affected tissues. (Pl. I.) One should avoid confusing bacterial spot with the early stages of anthracnose, where the tissues also appear water-soaked. The anthracnose spots are larger and more irregular than those caused by angular leaf-spot. More-

[1] The bacterium which causes this disease is known as *Bacterium lachrymans*. A bacterium (plural bacteria), like a fungus, is a small, simple plant, which lacks the green color found in more complex plants, such as our orchard, field, and garden crops. Molds, yeasts, toadstools, and mushrooms are good examples of fungi. Fungi can not make their own food as green plants do, and many of them obtain it from living plants or their dead remains. Most fungi which obtain their food and energy from living plants are known as parasites, while the plants upon which they grow and feed are known as their hosts. Such fungi usually cause harmful changes in the structure, composition, and activities of their hosts, which are known as lesions. Such lesions constitute disease. Thus, in bacterial spot of cucumbers the bacterium, *Bacterium lachrymans*, is the parasite which attacks and feeds upon its host, the cucumber fruit, causing spots or lesions, which are manifestations of the disease.

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over, a white, gummy exudate frequently accompanies the bacterial spot; this is not found in the case of anthracnose. The organism that causes bacterial spot does not by itself bring about a soft rot of the fruit. However, it is frequently indirectly responsible for this type of injury, as organisms that are capable of causing soft-rot enter at the diseased spots caused by it. Heavy losses in transit result from secondary infections.

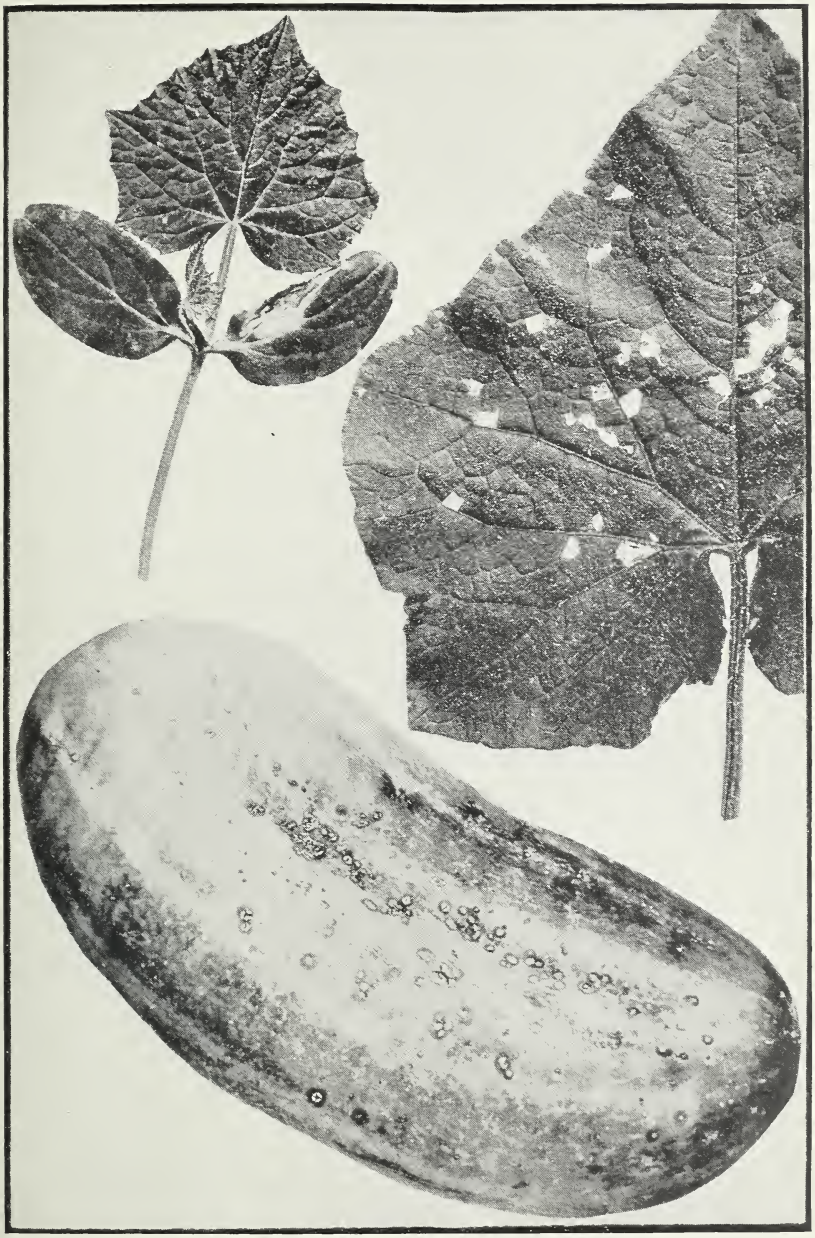
WHAT IS THE EFFECT OF THE DISEASE ON THE GROWING PLANT?

The disease first appears on the cucumber plant in the form of water-soaked translucent spots on the cotyledons or leaves. (Pl. I.) These spots are round to irregular on the cotyledons (seed leaves) and angular on the leaves, extending along the larger veins and under moist conditions increasing in number until the entire leaf is covered. Early in the morning tearlike drops of exudate swarming with bacteria are often found suspended from the lower surface of such spots. About eight days after the spot is first evident it becomes dry and white or tawny. Later the dry, affected tissue may be knocked out by heavy rains, giving the foliage in severely affected fields a very ragged appearance. (Pl. I.) The stems and petioles of new growth are occasionally attacked, with the result that they become water-soaked and later covered with a white incrustation of dried bacterial exudate. When weather conditions favor the development of the trouble on young plants early in the season, the vines may be considerably stunted.

The reduction of leaf surface brought about by severe infection often leads to a reduction in yield, and so far as the pickle industry is concerned the loss is principally confined to this type of injury, although instances are known in which considerable loss has resulted from a rotting of the small fruits on the vines. When cucumbers are grown for slicing purposes, however, opportunity is given for development of the disease on the grown fruit. This lowers the quality of the cucumbers and may make possible complete destruction by means of secondary soft-rot organisms.

WHERE DOES THE DISEASE OCCUR?

The bacteria that cause this disease are carried on the seeds; consequently it is not surprising that the disease is widely distributed, not only in the United States, but in Europe. To date, angular leaf-spot has been reported from the following States: Alabama, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, New York, North Dakota, Ohio, South Carolina, Virginia, and Wisconsin. The disease has also been found in Ontario and Quebec, Canada.



BACTERIAL SPOT OF CUCUMBER.

The disease starts with an infected seed, attacks the cotyledons first, and then causes angular leaf-spot of the vine. From the vine it spreads to the fruit.

HOW DOES THE DISEASE GET STARTED IN THE FIELD?

When bacterial spot is present in a seed field an opportunity is given for the bacteria to come in contact with the seed during the process of extraction. Usually seed harvested from a diseased field carries the causal bacteria. When such seed is planted the seedlings often become infected, with the result that the disease appears first on the cotyledons and later produces the typical angular spots on the first true leaves. From one or more leaf spots on a seedling the disease may spread over the entire field and be carried from that field to neighboring fields.

In case the field is one that was used for the growing of a diseased crop the previous year, it may rarely happen that seedlings from healthy seeds become infected from the soil. (Pl. I.)

WHERE AND HOW DOES THE DISEASE GET INTO THE FRUIT?

The original contamination of fruit takes place in the field. There the bacteria are produced in great numbers on the leaf and stem spots and are washed onto the fruit or the ground by rains, subsequently to be spattered on the fruit during heavy rains or blown upon it with soil particles. Fruit may also become contaminated during the picking and packing process.

Before the disease can develop in contaminated fruit, either in the field or after picking, infection must take place. Infection has occurred when the bacteria have entered the fruit and established themselves there.

WHAT CONDITIONS ARE NECESSARY FOR THE DEVELOPMENT OF THE DISEASE IN THE FIELD?

Dry hot weather tends to check the disease at any stage of its development. Rainfall, particularly if accompanied by wind, will spread the trouble, for the reason that the raindrops spatter the bacteria from diseased to neighboring healthy leaves. Rains that occur in the daytime spread the trouble more effectively than those which occur in the night. Frequent applications of water by means of overhead irrigation favor the distribution of angular leaf-spot in the field. Drainage water is a factor in spreading the disease from one part of a field to another. The bacteria are also carried on the hands and clothes of pickers. Insects may possibly be a factor in distribution, particularly from field to field. This, however, is a point which needs further investigation.

DOES THE DISEASE DEVELOP IN TRANSIT?

It may occasionally happen that infected southern cucumbers are packed for shipment to the North at such an early stage in the development of the disease that the spots are not evident to the naked

eye. In such instances, development may take place during shipment, with the result that fruit which appeared sound when packed may reach the market severely spotted.

Experiments have shown that uninjured fruit may be attacked, the bacteria entering the breathing pores on the surface. If picking is done in a diseased field when the foliage is wet, many of the harvested cucumbers must certainly be contaminated with bacteria transferred from diseased leaves by the hands of the pickers. If such fruit is packed while moist it is probable that infection will occur, with the result that fruit packed when apparently in a healthy condition will show spots when it arrives at the market several days later. This, however, is a matter yet to be demonstrated experimentally. It would, of course, depend in part on the length of time the shipment is in transit and the conditions of temperature and humidity within the car. Under favorable circumstances, artificially infected cucumbers show well-developed spots six days after the bacteria have been placed in the tissues. This matter should be investigated by means of experimental shipments.

WHAT SHOULD BE DONE WITH DISEASED CUCUMBERS?

Diseased cucumbers present an unattractive appearance and sell at a lower price than healthy ones. However, as the spots are shallow, but little waste results when such cucumbers are pared and sliced. To avoid loss, diseased fruit should be disposed of quickly, as various organisms of decay are likely to enter the bacterial-spot wounds and accomplish rapid and complete destruction of the fruit. If it is necessary to store or ship affected cucumbers, they should be packed dry and kept in a cool place. Good ventilation during transit is important.

HOW CAN THE DISEASE BE CONTROLLED?

Seed disinfection combined with crop rotation is the most satisfactory method of reducing loss from angular leaf-spot. Spraying is not recommended if the measure is to be adopted for control of this disease only. This is not on account of the fact that spraying is ineffective but rather because seed disinfection, which is a simpler and less expensive method to apply, will prevent the disease. When angular leaf-spot is once found on the foliage its spread may be largely checked by spraying with a 4–4–50 Bordeaux mixture.

Disinfection, usually spoken of as seed treatment, consists of immersing the seed in mercuric chlorid (1 part to 1,000 parts of water) for five minutes, after which it is washed thoroughly in water and dried. This disinfectant solution may conveniently be prepared from the standard mercuric-chlorid tablets sold by drug-

gists. It should be remembered that mercuric chlorid when taken internally is extremely poisonous. As the solution will attack various metals, it should be used in either a glass, earthenware, or wooden receptacle.

When making the treatment it will be found convenient to put the seed to be disinfected in a loosely woven bag, care being taken not to fill this bag more than three-fourths full, as some space will be needed to allow for swelling of the seed. Immerse the seed for five minutes and no longer. Then wash thoroughly in running water for 15 minutes or in several successive changes of water. The seed must be stirred while being treated and also during the washing process. After washing, the seed should be spread out so that it will dry rapidly. If it is to be replaced in the seed bag, this must also be immersed in the mercuric-chlorid solution and then washed and dried. The same solution should not be used for treating more than two lots of seed.

In case seedsmen or growers' associations wish to treat seed on a large scale, the Department of Agriculture will, on application, give directions for preparing the solution in quantity from mercuric-chlorid powder.

Extensive experiments have demonstrated that plants grown from treated seed on soil new to the crop are likely to be free from the disease unless infection occurs from near-by diseased fields. Seed should be disinfected by means of the treatment outlined above and, if possible, planted on soil that has not hitherto been used for a cucumber crop. If no such soil is available, allow as long an interval as possible, not less than two years, between successive plantings of the same field with cucumbers. When the disease is present in a field it is well to avoid working among the vines in the early morning or at times when the foliage is wet with rain, as such conditions favor the dissemination of the trouble on the hands and clothes of the laborer.

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